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By

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III. Coal and Pig Iron Situation.

A. Coal:

With the development of pig iron manufacturing at Kamaishi, coal especially coking coal sapplies to the iron manufacturing industry came to assume a higher importance inplace of charcoal as its sourse of fuel supplies. This is due to the gradual decrease of charcoal supply and also due to a marked rise in the cost of its transportation. This change from charcoal to coal was inevitable so long as the charcoal manufacturing industry as a sort of forestry failed, under various factors resulting from land monopoly and natural circumstances, to bring about a corresponding expansion of its productive capacity, as well as a consequent lowering in prices to meet the mounting demand. Under a certain natural and geographical condition, the charcoal manfacturing industry, compared with coal iron ore, and other mining industry, can not produce tangible results within a cestain period of time owing the natural limitation in the growth of trees and other natural conditions, whereas there is no such limitation in the mining industry. It should be recalled, in this connection, that, during the latter part of the 18th century, the process of iron manufacturing with cokes witnessed a rapid progress in England, spurred by an acute shortage of charcoal. In Japan, charcoal was in dire shortage at Kamaishi in 1882. In 1892, anxiety concerning the shortage of supply of charcoal was again expressed in a report submitted by Kageyoshi Noro. Under these conditions, the authorities of the Ministry of Industry took steps to rehabilitate the 25-ton blast furnace, which had previously been discarded, for the purpose of manufact uringi pig iron using cokes. In the following year, the repair and the installation of a coke furnace was completed, and, was put into

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operation immediately. Similar attempt had already been made in Japan in 1882 at Kamaishi. This, however, ended in a complete failure no account of incomplete preliminary study of the properties of cokes.

The replacement of charcoal by cokes as the fuel for the iron manufacturing industry thus push to the fore the question of coal, especially coking coal as the center of the raw material problems.

The remarkable increase in the production of pig iron at Kamaishi, which coutributed to the changing over from charcoal to cokes, was firstly due to the fact that the ore deposit there, upon a re-survey, conducted in 1892 jumped to a favourable estimate of no less than 14,000,000 tons, from an earlier estimated of mere 130,000 tons in 1883 and several milion tons in 1890. The second factor was due to the reduction in production cost following a rationalization program effected at Kamaishi, and thirdly, to the circumstances that the business depression, which had first asserted itself in 1890, had by 1892 told out its worst and that a reduced silver price had induced an increase in exports. The situation was further brightened by an improvement in the business condition with a greater demand for iron and steel ensuing on the eve of an imminent war against China. This served to consolidate the foundation of Kamaishi. Japan's victory in this war offered one of the major factors which went to stimulate the completion of the process of fuel conversion.

These circumstances brought about an eventual tie-up of the country's iron manufacturing system and the coal mining system and such combination, an a still larger scale, was to be materialized in the form of the Yawata Iron Works. In the following lines an attempt will be made to trace the process of the development of coal mining industry in our country.

Toward the end of the Tokugawa Shogunate and in the early years of the Meiji era, the European capitalist powers first placed an eye on the mining and transportation industries as the object of their profit-seeking schemes. Mindful of the danger inherent in an overdue reliance on foreign capital on the part of the backward nation, the Meiji Government issued a special Mining Regulation in 1872 stating that the ores produced as well as the right of mining belong to the State. In the following year, a mining law was promulgated, stipulating that only persons of Japanese nationality would be permitted to be an proprietor or a member of an enterprise engaging in trial mining, the leasing of a mining zone and the processing of the ores produced. The purport of this law was to preclude an unrestricted influx of foreign capital into the mining industry of Japan. Thus, as far as the coal mining industry was concerned, the

Miike and Takashima coal mines which had been under joint management of the feudal clan of Saga and a Britisher, Grabber, since the last years of the Shōgunate regime, and the Kayanuma and Horonai mines were placed under Government controls in 1873, 1876 and 1877, respectively.[1] At the same time, the Japanese Government authorities endevored to hire foreign engineers in order to induce advanced Western mining techniques in to the country.

From the end of 1880, the Government modified its policy: an overall direct Government control formula was replaced by that of selective supervision, and this, incidentally, marked the beginning of the period of the so-called Matsukata deflation (bearing the name of the then-Finance Minister Prince Masayoshi Matsukata). The point here was that those industries with less military importance were handed over to private management while others which were considered more important militarily as well as those directly connected to military production were gradually placed under either government monopoly or direct control. This resulted in placing Japan's coal mining industry on an immutable foundation, beginning in 1887. Following the step of the Takashima coal mines, which had already been handed over to private management, the Miike coal mines were entrusted in 1899 to the Mitui financial clique (Zaibatsu). At the same time, the Government, in 1885, took measures to designate the Chikuhō (in north Kyūshū) coal mine area as a special reseved mining area for the needs of the Imperial Navy. The Mitsui and the Mitsubishi, on the other hand, were not behind the Government in making advances in the Chikuhō region.[2] Thus, in 1887, Japan's coal mining industry came to a turning point, presenting a very different picture, as isolated coal mines, dispersed over a wide area either under direct Government control or private management, were steadily concentrated in the Chikuhō coal mine area, where both the Government and the Zaibatsu factions were to compete in the profitable management of majior coal mines. (Refer Table 1)

Table 1. Coal Output at Chikuhō (Unit 1,000 tons)

	Chikuhō outpt	Total domestic output	%
1885	236.0	1,293.7	18
1887	410.0	1,746.2	23
1892	1,039.7	3,175.6	32
1897	2,726.3	5,207.5	52

Note. (1) The Takashima mines were sold to Shōjirō Gotō in 1874. In 1881, these mines further changed hands and were placed under the Mitsui.

(2) Kaijima, 1884; Mitsubishi, 1889; Sumitomo, 1894; Furukawa, 1894, and Mitsui, 1896.

A similar formula was likewise applied to the Hokkaidō and Jōban (in north Kantō district) region, where, the coal mining industry was also given an initial impetus for development by Government direction, and, then, headed to further expansion under able private hands. As for the exploitation of the coal industry in the Hokkaido, the first steps taken were the carrying out of a thorough geographical survey at the hands of an American named Lyman Monroe, who conducted the difficult work under a special request by the local Japanese authorities. L. Monroe, further, undertook the management of the Kayanuma and Horonai mines. In 1889, the Hokkaido Tankō Tetsudō Company (affiliated to the ex-feudal clan of Satsuma; later re-named the Hokkaidō Tankō Kisen Company, when the organisation was taken over by the Mitsui) was inaugurated. The new company placed three major mines, the Horonai, the Ikushunbetsu and the Sorachi as well as local railway network, under its management. In the following year, the company embarked upon the development of the Yūbari mines. In spite of all these measures, the situation in the Hokkaidō could not compare with the Chikuhō area in Kyūshū, both in respect to the speed with which it was developed and to the extent of the effort made for its development. And, this difference in the development between the two area was, no doubt, due not only to the existence of richer coal deposit in the Chikuhō Area but also due to the importance of Norther Kyūshū Area from military and economic points of view.

While Japan's victory in the Sino-Japanese War made the importance of the Chikuhō Area decisive, this was also the main factor of the Yawata's further expansion. In November, 1897, the Yawata bought up the Futase coal mines in the Chikuhō ara for securing coking coal supplies. Subsequently, they concentrated their efforts in securing its control over Tayeh (in China). These moves implied a trend toward a combination between Japan's iron and steel manufacturing orgnisation, depended heavily on the supply of iron ores obtained at Chinese and other territorial mines and coal-mining industry in Japan. Such combination, at the same time, signified a handshake between the State capital and the monopolistic Zaibatsu capital. The importance of the Chikuhō mine area was further increased to meet the needs of the gigantic Yawata Iron Works.

This, on the other hand, meant that Japan had within its reach a highly important military and economic "base" on the China continent. The transition from charcal to cokes as marterial for making pig iron at Kamaishi and its tie-up with the Yūbari coal mines and the close combination effceted between Yawata and the Chikuhō not only bespeak the pre-

ponderant importance of the question of coal supply occupying in Japan's iron manufacturing industry but also indicate the direction in which a solution, if any, of that vital issue was to be sought.

This, however, did never mean that a solution was there already. In the lines that follow, an effort will be made to describe the circumstances relative to the problem of coal.

There is now available no reliable data indicating the total amount of coal (especially coal for making cokes) being consumed by the entire range of the iron manufacturing industry of Japan in the early Meiji years. According to a statistical table of coal delivered to the Yawata Iron Works, however, it is seen that, with the years 1904–1905 as a turning point, the consumption of coal soared rapidly up above the 400,000-ton level. Shirō Watanabe, in his "Synthetic Coal and Coal as Raw Material", estimates that the consumption of coal by Japan's iron and steel industry stood at approximately 430,000 tons in 1897, 900,000 tons at the time of the Russo-Japanese War, and at about 1,000,000 tons toward the end of the Meiji era. What should be noted with special attention is the fact that, with the exception of a small quantity of coal imported from overseas in 1906, most of coal consumed up to 1907 was produced domestically. The Yawata Iron Works, at its in auguration, planned to obtain its own source of coal, especially coking coal and as to be mentioned above they moved to buy the Futase mines. An authentic chronological description of the history of Yawata refers to the fact that in the early days of its establishment, they chiefly depened on their coal supplies from the Futase coal mines, followed by Mike, Takashima and other minor mines located in the Chikuhō mine area. It is noted, in this connection, that this program succeeded to a certain extent in the 1890's. That Yawata was so eager in obtaining access to the Tayeh iron ores may well be accountedf or the fact that the supply of coal needed for its foundry could thus be assured from a number of domestic mines. However, the program was not without its defects, and this was already noticed in the 1890's. The major portion of coal produced in Japan was of low grade, which, although suitable for generating gas, heating boilers and other heating purposes, was not fit for coking coal used in the blast furnaces. Yūbari and Futase were about the only mines which could produce coal fit for the latter purposes, and even coal obtained at these mines were not considered to be perfectly suitable for making cokes to be fed to the blast furnaces.

Indeed, one of the main reasons of the failure of the blast furnace operation in the initial stage was to be found in such inferior quality of

the cokes available. In order to meet the growing consumption of coal as a result of the successive installation of blast furnaces following the Russo-Japanese War, and also due to the necessity of over coming the defects inherent in the quality of domestic cokes, Kamaishi, started to import the Kaiping coal from 1909, which was mixed with the Yūbari coal at the ratio of 25% to 75%. On the other hand, Yawata Iron Works also undertook to import high quality bituminous coal produced at Penshihu in Manchuria and Kaiping in North China, in 1910. The coal imported from the Chinese mainland was mixed with the domestic coal, which resulted in improving the operational efficiency of the blast furnaces, and also opened the way for an eventual successful attempt at manufacturing such cokes as would stand use for large blast furnaces. The immediate result was the lowering of the coke cost, which, in 1909, stood at 11.63 yen, occupying 41% of the production cost per ton of pig iron at Yawata, to 7.13 yen, corresponding to 35% of the production cost in 1912. This was largely due to a reduction in the amount of cokes used as well as a general decline of the coal price. The improvement of the quality of cokes, coupled by an additional income accruing from by-products of coke manufacturing was also responsible for such reduction, while it should not be overlooked that the lowering of the production cost of pig iron during these years was chiefly due to the reduction in the cost of coke. (Refer Table 2)

The fact, mentioned above, is highly important as indicating that Japan's iron and steel manufacturing industry was enabled on its own only after a steady supply of coal from the Chinese mainland was assured during the last years of the Meiji era. In 1912 Yawata Iron Works secured its coking coal from the following sources:

Futase coal	200,000 tons	(66%)
Penshihu coal	40,000 tons	(13%)
Kaiping coal	30,000 tons	(10%)
Miike coal	20,000 tons	(7%)
Takashima coal.....	12,000 tons	(4%)

The foregoing breakdown clearly indicates that the major portion of coal supplied to Yawata Iron Works was still occupied by the domestically-produced coal. On the other hand, the overall coal situation in Japan was such that, against 320,000 tons of coal imported from overseas, she was still capable to export roughly ten times as much. From this, we can see that, at that time, coal was imported to our country owing to the

Table 2. Ratio of Cokes Cost against Total Pig Iron Cost at Yawata Iron Works (Unit Yen per ton)

Years	Cokes cost	Iron Ores	Total cost
1909	11.63 (41%)	11.88 (42%)	28.42 (100)
1912	7.13 (35%)	9.54 (47%)	20.20 (100)

scarecity of high quality coal and not from the lack of quantilty. Indeed, the problem of low cost, high quality iron ore and coal lay at the very foundation of the iron and steel industry in Japan, because, she then was still considerably backward technically, and was not in a position to expect a sufficiently big production of by-products in the course of iron manufacturing, and thus, the problem naturally posed a factor vital to the very existence of our iron and steel industry. And, this particular circumstance was responsible for the fact that, following the termination of the Russo-Japanese War, Japan lost no time in moving to place under her exclusive control the Fushun coal mine in Manchuria (1905), the anthracite coal mine at Pyongyang in Korea (1907, placed under direct Naval Control in 1922), the Penshihu mine (developed by the Ōkura Zaibatsu in 1909). Japan's advances on the Chinese miainland, it is noted, was destined to bring her into violent competition with Britain, who, at about the same time, launched on the programs of expansion of the Kaiping (later known as Kailen) coal mine.

B. Pig Iron:

It is generally said that it was after the end of World War I, and also with the assumption of greater importance by the civilian steel manufacturers during the last decade of the Meiji era, that the problem of pig iron as material came to assume greater importance in the iron and steel manufacturing industry in Japan. If, however, this theory is taken to mean that pig iron had not until this time had any importance as material, it would be to commit a grave error. To understand the situation in this connection, it would be imperative that the history of pig iron, tracing the course which led it to such an important position in Japan's iron and steel industry, be duly taken into consideration. A brief description of such history will be given in the lines that follow.

Until the founding of the Yawata Iron Works, most steel was manufactured in Japan at army arsenals, where the industry saw a steady growth. In spite of the failure of the government-run iron manufacturing plants during the first decade of the Meiji era, the persistent requirements for manufacturing armament compelled Japan to embark upon a big arms expansion program after 1882. With the imminence of a frontal armed clash with China during the second decade of Meiji, faced mounting needs

of manufacturing steel at her own arsenals. At the time of the Sino-Japanese War, however, the output of steel in Japan amounted to mere 1,200 tons, while no modern steel manufacturing factories had yet been inaugurated with private funds. Most of the demand for iron and steel by private enterprise was met by the import and domestic produotion of steel was carried out only at the military arsenals. This is one factor which explains the fact that in Japan the pig iron and steel manufacturing industries had to follow a separate course of development. And, this further explains the reason why the plans submitted for construction of steel foundry during the second decade of Meiji were originally intended to meet military requirements. The separation of pig iron and steel manufacturing persisted even after the establishment of Yawata Iron Works and the advance of Kamaishi into the field of steel manufacturing. It continued, on a bigger scale, after the phenomenous rise of civilian steel manufacturing works during the closing years of Meiji and following the termination of the World War I.[3)]

Now, pig iron as a raw material has peculiar significance in exerting direct influences on both the pig iron manufacturing and steel manufacturing industries.

With the founding of the Yawata Iron Works, 50 % of the total demand of pig iron in our country was manufactured domestically, but Japan was still not in a position to free herself from the persistent pressure being exerted by imported pig iron. At this time, domestic price level of pig iron was controlled by the price of English-manufactured pig iron. The foreign-imported pig iron, which had over-ruled the pig iron manufactured by the original Japanese method and also that manufactured at Kamaishi, during the first and second decade of the Meiji era, still retained its leadership. Even with a considerable decline in the market price per ton of pig iron manufactured at Kamaishi due to the reduction of its production cost following the development and improved production facilities at

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(3): Main reasons why steel manufacturing industry developed in Japan separately from pig iron manufaturing industry may be found in the fact:

(a) that those who engage in steel manufacturing industry was required less investment than those who manufature both pig iron and steel, while the fund invested was rotated more quickly;

(b) that the superior technique already attained in army atsenals coul'd be fully utilized, and that the any rendered a positive assistance to it. While it cannot be denied that all this originated from the predominant needs of preparing for the imminent war with Russia, it should not be left out of consideration that the product found the largest demand from Government offices like the Board of Railways, and the armed services.

Kamaishi, the price of domestic pig iron was still higher than imported pig iron as seen in Table 3.

Table 3. Comparison of Pig Iron Prices (Unit Yen per ton)

Year	Market price of Kamaishi pig iron	Import price of foreign pig iron	Market price of imported pig iron
1882	31.20	19.23	27.50
1893	23.30	19.55	unknown

That, in spite of the reduction of the production cost due to the continuned expansion of Yawata Iron Works and the consequent favorable competition with imported pig iron, the price of the domestically manufactured pig iron had to follow the steps of foreign-made pig iron is clearly indicated in Table 4.

Table 4. Comparison of Price of Foreign & Domestic Pig Iron (Unit Yen per ton)

Remarks / Years	Import Price.	Dcmestic Price
1901	38.4 yen	41.3 yen
1902	34.0	37.9
1903	34.0	37.9
1904	35.7	38.8
1905	38.0	53.7
1906	38.2	37.2
1907	39.9	41.0
1908	36.5	39.5
1909	32.1	35.9
1910	32.4	36.7
1911	33.8	38.4
1912	36.2	43.3
1913	39.9	45.7
1914	39.7	44.3

The mounting demand for iron and steel during and after the Russo-Japanese War brought about an increase in the demand for making steel and for iron castings. This was an indication that the steel manufacturing by civilian hands and at shipbuilding yards and arsenals was witnessing a marked development. Inspite of these development, the production of Japan's pig iron manufact uring industry, which still suffered under the pressure of imported pig iron, was inadequate to fully meet the domestic demand, and, naturally, Japan's reliance on foreign-manufactured pig iron remained to the same extent as before. The fact was that private steel manufacturers had to depend chiefly on an imported pig iron as the material for their steel production and only a fraction of their requirements were met by domestically-manufactured pig iron. The post-war panic during 1907–1908 (this panic in Japan was worsened by the effects of the panic which started in U.S.A. in the autumn of 1907 and did not recede until 1910), coupled by the dumping of pig iron at the hands of the panic-affected foreign merchants, affected Japan's private steel manufacturing industry so adversely that the young rising steel industry

was for a time forced to see its growth checked. And, this unavoidably led to the importation of Indian pig iron, which was being quoted at a considerably lower price.

Now, let us review the problem from a point of view of the tariff policy. With the inauguration of the Yawata Iron Works and the beginning of the supply of iron ores from Tayeh, the Government took the steps in 1901 to alolish the import tariffs, on iron ore. However, with regard to the import of pig iron, the tariff imposition was continued, even after the revision of tariff agreemant effected in 1899, at the rate prescribed for in the agreement on revised tariff agreement reached in 1865, and this practice was kept up to March, 1925.[4] While this indicates the lack of favorable conditions for making possible the adoption of a protective tariff measures for the domestic pig iron industry against the imported pig iron, it also showed that the situation remained where such conditions were allowed in existence. This becomes unmistakably evident when a comparison is made with the the German tariff rates, which already were on the world level. (Refer Table 5 &6).

That the Government could not adopt a policy of positive protective measure not only on pig iron but also on rolled steel (the import duty on rolled steel, however, was somewhat rised in 1911), was, of course, due to the fact that Japan at that time had not yet attained her autonomy regarding the tariff. The positive opposition raised by the shipbuilding and machinery industries against such a protective policy for fear that such measures will bring about a rise in the price of iron and steel and eventually affect their industries as well as the conservative attitude of the general public was, partly, responsible for the continuation of such a situation.[6]

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(4): Masayoshi Matsukata, Finance Minister in 1899, is reported to have remarked: "There is practically no chanse in protecting even the iron and steel manufacturing industry, which will constitute the backbone of the Japanese industry in the future, and since this item (pig iron and steel etc) on which tariff rate is fixed is imported in substantial quantity, its adverse effects on the country's revenue etc., is indeed very great." (*Zei-Kan 80 nen shō-shi., 1954* — 80 years short history of Japanese coustom house —p. 48)

(5): It is recorded that even Dr. Umiichi Toda, (professor at Kyōto University) who was then considered to be one of the most impartial scholar made the following remark concerning the self-supply of steel: "Although I am never behind anybody in recognizing the importance of the iron and steel industry, I would propose that, in case there is no prospect of attaining the self-supply of iron and steel within our country, the only alternative would be to have the military demand supplied domestically and have the major demand met by cheap imported product, and, in the light of this consideration, there is absolutely no need to impose high import duties on it." (*U. Toda, Nippon no Keizai., 1911*—Japanese Economy—p. 424, pp. 526—527)

It is noted, in this connection, that the intensification of the international competition for acquisition of markets naturally tended to work against the protection of basic industries, while the threats of war and the consequent acceleration of armament race also worked against a systematic combination of our pig iron and steel manufacturing industries. This, in other words, had to kept the pig iron and steel industries separated as they had ever been since the early years of Meiji, era, and to stimulated civilian industries to continue to rely upon foreign pig iron. This, incidentally, served to offer a foundation on which pig iron was destined to play a highly important role as far as the material for Japan's steel manufacturing industry was concerned.

Table 5. Comparison of Tariff Rates in force in Japan & Germany, respectively, in 1911 (Yen per ton)

	Japan	Germany
Pig iron	1.66 (1.38*)	5.00
Scrap iron	1.66	5.00
Bar steel	10.00	12.00
Section steel	10.00	30.00
Plate	6.66 (5.00*)—12.50	15.00—22.50
Rail	13.33	12.50

*—Conventional tariff rate.

Table 6. Transition of Tariff Rates on Pig Iron (Sen per 100 kin)

Years	Autonomous Tariff	Conventional Tariff
Up till end of 1898	4.7	8.3 (5%)
From Jan. 1, 1899	8.3 (5%)	
From Apr. 1, 1903	11.3 (8%)	—
From Oct. 1, 1906	10.0 (5%)	—
From July 16, 1911	10.0 (5%)	8.3 (4.2%)
From Mar. 29, 1926	10.0	Abolished

In the tariff revision effected in 1911, the duties on rolled steel were increased to 10–30%, which, virtually, was a step taken in the direction of an exclusive protective policy. In spite of this, and, further, in spite of the fact that the measure meant an implicit support on the part of those engaged in manufacturing of steel with imported pig iron, the reason why a actual tariff rate of 4.2% was agreed on between Japan and England should not be found in the lack, as mentioned earlier, of such factors, on the part of Japan, which would stimulate a positive policy for the protec-

tion of the pig iron industry.

While it was with civilian capital at the background that a forward step was thus taken for the protection of steel industy, it should not be overlooked that the existence of the Nippon Seikō-Sho (Japan Steel Works) at Muroran, (in Hokkaidō) spoke much for the reduction of tariff rates on pig iron.

Nippon Seikō-Sho which was inaugurated at Muroran in 1907, was a establish as a joint venture of Armstrong and Vickers, two of the first-rate arms manufacturing companies in England together with the Hokkaidō Tankō Kisen Company (an affiliate of the Mitsui-Zaibatsu), and as such was the target of worldwide attention. This company was virtually a plant where arm and armament required by the Japanese Navy were manufactured, and it ranked among the foremost arms factories under private management, not only in Japan but in Asia.

The Nippon Seikō-Sho started its operation in January, 1911, with a capital of ¥15,000,000 (shared evenly by Japan and England), and an additional ¥10,000,000 was collected through the issuance of corporation debentures. This total of ¥25,000,000 was well above the ¥20,000,000 investment requred for the initial inauguration of the Yawata Iron Works. It is estimated that, immediately prior to World War I, the companys fixed assets was valued at no less than ¥22,000,000, which closely followed Yawata's ¥34,000,000.-(This may be compared with significant implications, with the case of the Nippon Kōkan Co., [Japan Steel Tube Co.,] inaugurated in 1912, with a capital of ¥2,000,000, the initial amount paid-in reaching mere ¥1,200,000.) Further,Nippon Seikō-Sho was ahead of Yawata Iron Works in erecting two 50-ton acid open hearth furnaces.

England made her successive advances in this part of the world in consequence of the conclusion of the second Anglo-Japanese military alliance pact in August, 1905, and, further, in order to substantiate the third Anglo-Japanese Alliance effected in 1911, which was intended to protect the British interests in the Far East against the inroads of the newcomer, Germany, after the defeat of Russia at the hands of Japan. This, in other words, was to say that Japan's position as a watchdog for Britain was firmly established. Secondly, England, in these moves, was motivated by the necessity of investing overseas her surplus capital consequent upon the worldwide financial panic in 1907.[6] Thirdly, England desired to maintain her market in the face of the growing expansion of Japan's military industry, and, lastly but not the leastly, she attempted to control, the arms

(6): As have been refered to earlier in this article, this particular circumstance should also be taken into account in explaining the rapid increase in investment of foreign capital in our country after the Russo-Japanese War.

weapons used by Japanese Navy. England, at the same time, was shrewd enough to have it stipulated that the pig iron used at Muroran be confined to that imported from England. These factors existed behind the motives when she agreed upon tariffrate on imported pig iron and raised a consistent opposition to any raise on import duties on iron and pig iron.[7]

This, however, does not mean that Japan, on these accounts, gave up taking measures towards the eventual self-supply of pig iron. The successive expansion at Yawata Iron Works was one indication of this, while Japan's determination was more eloquently indicated in her insistent endeavor to secure her control of coal mines as well as iron ore deposits on the Cntinent of China. The plan was already on her timetable, and the ambitious undertaking had already been initiated in the increased import of pig iron manufactured at Hanyang in 1902. In 1907, 24% of the total import of pig iron was from Hanyang. Furthermore, the Hanyang pig iron was being quoted at a much lower price than the English-manu factured product. (Refer Tables 7 and 8).

In October and December, 1906, Imperial decrees were issued, which stipulated that products imported from the Kwantung leased territory and pig iron manufactured in China mainland will be treated equally under the conventional tariff-rate. This further indicates that Japan was intent upon her policy of supplementing domestically-manufactured pig iron, with pig iorn imported from the China mainland. With the issuance of the aforementioned Imperial decrees the autonomous tariffrate of 10 sen per Kin imposed on the Hanyang pig iron used at the Yawata Iron Works, was lowered to 8.3 sen as same as those imposed on British and other country's pig iron. This, on the other hand, placed an additional handicap on the part of the domestic pig iron manufacturing industry, which had no tariff protection. The monopoly of the cheap Chinese pig iron by the Yawata Iron Works, oppressed the operation at Kamaishi, and this had an adverse affect on the domestic production of pig iron as a whole. This same policy of securing steel material from the China mainland followed both by the government and the Zaibatsu alike was continued and expanded through the Taisho era (1912—1926), and this policy itself served as a deterrent in raising thet ariff rates on pig iron.

Towards the closing years of the Meiji era, the weight of English pig iron gradually decreased, and had given place to the Indian-manufactured pig iron, which eventually replaced the pig iron imported from China. The

(7): The agreement further stipulated that the Japanese Government will not pay any special subsidy for encouraging the manufacture of pig iron.

emergence of China and India as the sources of steel material supply, later proposes an important problem on the supply of pig iron. This particular point will not be taken up in this article. Mention should here be made of Korea, which was annexed to Japan, in 1910. In Korea the old tariff rates were allowed to continue for another ten years. Furthermore, no specific steps were taken on the tariff provisions on iron and other products, because Japan at that time was endeavoring to rectify her own unequal treaties and was fearful of resentiment and repercussions by the Western countries, which had already invested in Korea.

Table 7. Comparison of Pig Iron Imports from Foreign Countries (1,000 tons)

	Total imports	Ratio against total demand	England	China	India
1892	12	41%	87%	—%	—%
1897	44	62	85	—	—
1902	29	41	73	6	—
1907	97	41	71	24	—
1912	229	49	69	3	22
1913	265	52	38	23	31

Table 8. Comparison of Import Prices of Pig Iron (Yen per ton)

	Domestic pig iron	English pig iron	Chinese pig iron	Indian pig iron
1901	37.9	34.3	27.9	—
1907	41.0	37.6	34.1	—
1913	45.7	41.5	34.2	35.7

3. Summary——Concerning the raw material problem and the resources

In the foregoing chapters, main attention was focussed on the process of the growth of Japan's iron and steel industry, represented by the phenomenal growth of the Yawata Iron Works, and we have tried to trace the history of how the problem of raw materials was handled together various other factors underlying this vital problem. As a summary of the chronological description of the problem of raw materials, the attempt will be made in the following lines to enunciate the peculiarities of this problem, especially in relation to the iron ore resources.

It has already been clarified that Japan's raw material problem was intertwined with her capitalistic production system. Even supposing that her domestic resources were inadequate to meet the demand, a solution

can invariably be found in a progressive modification of her production formula. This should, on the other hand signify that with the change in her production formula the solution of raw material problem can also keep up with this change. From this point, any attempt to justify the contention that the peculiar development of the raw material problem in Japan is due to the lack of raw materials, should be discarded as entirely erroneous as overlooking the controlable nature (economic factor) of such resources.

This, however, is not to assert that the contemporary and subsequent development of Japan's iron and steel industry was brought about entirely free from the restraints resulting from the inadequate resources. It should be definitely stated that the traditional lack of iron ore resources in Japan (it goes without saying, of course, that this lack, in itself, was brought about, historically, by capital[8]) constituted a powerful factor determining the shape of Japan's iron and steel industry, and also, the peculiar aspect her raw material problem. While, of course, the richness and the location and in what shape the iron ore resources is formed, provided that rise and decline of wages is kept out of consideration, they will constitute a major factor which goes to determine the price of raw material. In case of Japan, however, it was undeniable that the amount of iron ores in existence in utilizable condition, apart from their absolute amount was, in spite of their comparatively high purity, were quantitatively inadequate to meet the growing demand of her iron and steel industry. That these ores were located in various different localities, as has already been shown by surveys which have been undertaken from time to time, is a another disadvantage to be borne by Japan's steel industry.

These umfavorable conditions within the country, as has been mentioned earlier, unavoidably drove Japan on her ambitious schemes of securing the iron ore supply from Tayeh, where the resources were found to be in a much advantageous conditions both in regard to their richness and shape of deposits.

It should be noted, however, the circumstance referred to in the foregoing lines became a decisive factor for determining the peculiar development of Japan's raw material problem only under her peculiar capitalistic production system, which faced the rapid growth of the international monopolistic capitalism, and also under the condition that it, was unable to transform both the qualitative and quantitative composition of her iron resources.

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(8): It was only after the inauguration of the Yawata Iron Works that the shortage of raw material resources came to the fore as a burning issue in Japan.

Even though it should be conceded that Japan's iron resources were both inadequate in amount and were located at widely dispersed areas, it should not be taken that the amount was absolutely insufficient to meet the demand for iron ores required for making pig iron. It was only because, at the contemporary stage of development of industrial production, it was found both unprofitable and impossible, in regard to the price, to have the iron ore production raised to the level where the demand stood. There was a inter-relationship between the supply of iron ore from the China and the production of iron ores at domestic mines. Japan's advance to the China Continent and securing of iron ore supply from there inevitably resulted in a reduction of iron ore production at home. For an expample, the operation at Kamaishi which relied on domestic iron ore supply for its pig iron production was affected and this in turn, worked to check the production of iron ores at home. (Refer Table 9)

Table 9. Iron Ores & Production Index
(Unit 1,000 tons: 1901 as 100)

	Iron Ore	Its Index	Pig Iron Output Index
1901	48	100	100
1907	104	216	246
1914	121	272	526

This circle of co-relation, further, caused a lessening in utilization of such resources as iron sands and sulfureted iron ores. An attempt had already been made as early as 1883 at the Hiroshima iron mines to utilize the iron sands, estimated to be deposited in the Japanese islands in several hundred million tons or even virtually inexhaustible, for the production of pig iron. A vast scheme of development was presented to Masayoshi Matsukata by Fuyukichi Kobana, was in charge of the mines (in 1888). The plan, however, was not approved and no further development was seen at the Hiroshima mines. What blocked the utilization of iron sands in the Western method of pig iron manufacturing was, among others, the difficulty in mining, selection, consolidation and transportation of iron sands as well as the difficulty encountered in the separation of titanium component and also the troubles attendant on the ownership of the mine areas. With the suspension of the operation at the Hiroshima mines, any large-scale investigation and survey of iron sands resources was practically completely abandoned by both the government and civilian enterprisers, until the undertaking was taken up for a second time in 1916.

The same situation applied to the sulfureted iron ores, the deposits of which are richly found in Japan. As early as 1887, an attempt was made at

the Yamane smelting plant of the Sumitomo-operated Besshi Copper Mines, (in Shikoku) to separate, according to the Western process, the component copper, sulphur, iron and others from copper-containing sulfureted iron ores. While this was the first occasion in Japan that sulfuric acid was manufactured out of sulfureted iron ore, further attempt at manufacturing iron with the use of the so-called sulfuric refuse (containing 40-60% of iron) after copper, sulphur and the other components had been extricated, was made for the first time by a special iron manufacturing corps set up at the same smelting plant in June, 1890. However, extrication of the copper component from the ore was found so difficult that the attempt was given up already in November, 1894.

While the commencement of the manufacture of sulfuric acid from the sulfureted iron ore encouraged the production of the latter in Japan, its use for manufacturing iron had to be abandoned at this level of development, until, 1920, when new researches in this particular field were again taken up. However, Japan's contemporary private capitalists were unable to finance such researches on a big scale and consecutively for a lengthy period (For instance, the Sumitomo then could appropriate a sum of ¥100, 000 as research funds spread over five years; the project, which began in 1893 was discontinued after only one year). The government, on the other hand, was so eager upon securing the supply of necessary ores from China that it naturally give up attempt to develope the domestic resources. Thus, various factors combined to make the original shortage of ore resources at home be felt more acutely, and this fact must not be overlooked.

Now, let us turn our eye on aspects of survey conducted on ore resources at home. Although the richness and location and type of deposit of the iron ores are what are bestowed under specific geographical and natural conditions, but the recognition of their very entity must await the survey by human intellect. The commencement of the investigation of the iron resources and its reserves in Japan roughly coincided with the acceptance of iron as the foundation of modern industry and its recognition as an indispensable resource. The first investigation of Japan's iron resources was conducted in July, 1872 by a foreigner, named Godfrey, who, as an employee of the Japan's Ministry of Industry. He inspected the iron mines located over a widely separated areas in the northern Honshū, and as a result of his survey he reported on the superiority of Kamaishi mines. In 1875 another foreign employee conducted further investigation of Nakakosaka mine at Kamaishi. This was fol lowed by a pesimistic report prepared by a Yajirō Itō of the Ministry of Industry, to the effect that reserves at Kamaishi amounted to merely

130,000 tons. The reliability of this report is doubtful, as it may easily be presumed that it was prepared for the ulterior purpose of placing the responsibility for the failure of the management of Kamaishi at the door of the shortage of the resources available.

In 1883 the Geological Research Institute was established within the Ministry of Agriculture and Commerce, which undertook minor-scale investigations. These investigations, however, were no doubt far from being thorough.

The first step in full-fledged investigations of iron ore resources, was taken only after the bill for inaugurating a government-run iron manufacturing factory was rejected by the second session of the Diet in 1891 for the reasons of the inadequacy of the preliminary investigation of raw material resources, and by the establishment of the commission to conduct investigation on the steel industry in June 1892. Senichi Ōtsuka, of the afore-mentioned Geological Research Institute, who engaged in the investigation, was critical of the Ito report referred to above, and asserted that it would be possible to turn out 6,500,000 tons of pig iron with the iron ore resources deposited in the Kamaishi area. This would mean, his report said, that, at the rate of 50,000-ton output per year, a continuous production of pig iron for 130 years to follow would be possible. On the basis of these reports, the Commission, in September, 1892, submitted to the Government an advice regarding the results obtained by the investigations of the iron mines at Kamaishi, Sennin and Akatani and that of the iron sands deposits located in Hokkaido. The conclusion of this report ran as follows:

"An estimate of the iron ore deposit at the four mines just surveyed, which can be easily mined being comparatively near the surface will safely be put at no less than 15,650,000 tons, from which well over 7,360,000 tons of pig iron con be manufactured. In addition to these, there undoubtedly are to be found other localities where rich iron deposits are expected, which, however, are not yet investigated..... As innumerable other spots are believed to have rich deposits still untapped, it would safely be admitted that, as far as iron manufacturing is concerned, there should be no fear of its raw material being in shortage."(9)

That this report was rather optimistic is undisputedly evident. It, however, was highly significant in that it indicated that the shortage of raw materials, often voiced at that time, was not entirely due to a shortage of resources. Suggestive in this connection is a report written by Artillery Colonel Yasuhisa Katō about the same time. The report, in part,

(9) *Tetsu-kō* (Consideration into the Iron), 1893, pp. 93—107.

said; "It is simply beyond expectations that the Kamaishi area is deposited inexhaustibly with iron ore resources and bountiful charcoal fuel resources. In spite of this, the area at present produces small amount of pig iron, which is of such inferior quality. What is the reason for this? It is simply because the method of mining and transporting is still far from being satisfactory, while the machinery in use there are mostly of inferior quality and the refining process is void of uniformity."[10] The report, in conclusion, advised that the avowed shortage of raw material was, actually, due to a shortage of capital needed for improving the installations.

Then, the report by the provisional commission for the investigation of the iron manufacturing enterprise, submitted in October, 1883, was similarly critical of the previous contention that the failure of Kamaishi was caused by a shortage of raw material and, in its turn, tried to find the causes for the faulure in: (1) inadequacy of investigation of raw material; (2) the area where mining of iron ores was made was too limited; (3) insufficient supply of charcoal and coal fuel; (4) unsatisfactory transportation facilities in the mining area; (5) small demand for iron products; (6) high price of pig iron; and (7) unskilled techniques.

The iron ore deposits at Kamaishi were further subjected to successive surveys. While the estimate in 1892 stood at 14,000,000 tons, that towards the end of 1895 stood at 49,000,000 tons. However, such optimism, as described in the foregoing lines, was destined to be short-lived, for, as soon as Japan found itself in a position to be assured of a supply of iron ores from Tayeh coupled by a growing demand for iron, such theory against the alleged shortage of ore resources was at once discarded. And, this was immediately followed by a theory, emphasizing that Japan's iron ore resources were in utter shortage, which attempted to justify Japan's advances on the China continent. Optimism about iron ore resources in Japan was never to be seen again.[11]

After this, Japan's effort in regard to survey and investigation of iron ore resources, which was conducted jointly by the government and the powerful Zaibatsu was exclusively concentrated in Korea, Manchuria, Northern China and the extensive area on the Yangtze central around Tayeh.

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(10): *ibid.*, p. 157.

(11): The shortage of the iron resources in Japan was for the first time officially reported to the world in a report presented by Kinosuke Inoue to the 1910 International Convention on Geology. According to Inoue, the iron ore deposits actually investigated then amounted to 18,790,000 tons, while he estimated that the total deposits would amount to 36,000,000 tons.

Thus, it is seen that, as the iron and steel industry grew in Japan, demands for raw materials for the industry, also increased and in order that the price of raw materials will be kept stable despite the unavoidable tendency that it was liable to rise, effort were made to stress on an international scale of Japan's inherent shortage in the resources and all efforts were made to secure resouces on the Continent. This amply accounts for the fact that investigation of resources at home was never thoroughly carried out. Just as, the paucity of China's own iron resources, and not her lingering semi-feudalistic institutions and her subjugation to Western inperialistic aggression, was held chiefly responsile for her remaining in a semi-colonial statius, so the issue of a shortage of Japan's iron resources, was exclusively taken up for explaning away every aspect of her iron and steel industry, at the same time justifying her aggresive adventures on the China Continent.

The above statement should not, however, be construed as implying that Japan's iron resources, both with regard to richness and shape of deposit, have ever been bountiful.

That Japan's resources were no comparison, as far as the contemporary investigations went, to the deposits at Tayeh was undeniable, for the latter justly boasted of a deposit estimated at 100,000,000 tons, of which no less than 18,000,000 tons were considered to be immediately available.[12]

What the writer wishes to make clear is the fact that the absolute amount of resources concerned alone is never the exclusive factor which makes an alleged shortage of such resources be felt more acutely, and that the problem of resources, which is of controlable nature (economic factor), is handled as noncontrolable nature (physical factor) also originates from the capitalistic production system.

(12): While Japan's iron resources at that time had not yet been subjected to adequate, and sufficient investigation, the estimated deposits immediately available by digging, according to a report made by the Bureau of Mining in 1916, amounted roughly to 70,000,000 tons (excepting iron sands). Nine mines were estimated to have deposits more than 1,000,000 tons, of which the majority (with the sole exception of Kamaishi, with 35,000,000 tons) had deposits ranging well below 10,000,000 tons.